REMARKS

Claims 25 and 28-48 are currently pending in this application. This amendment cancels claim 28, amends the specification and claims 34, 35, 41, 42, and 44-47. Support for the amendments to the specification and claims can be found in the specification and claims as originally filed. No new matter has been added.

The Examiner has objected to the specification for failing to provide antecedent basis for the claimed subject matter. Specifically, the Examiner asserts that the subject matter disclosed in claims 32 and 41-43 is not disclosed in the specification. Page 2, lines 20-35 of the specification originally contained references to the claims. These references were deleted by Preliminary Amendment without adding the subject matter of the claims back into the specification. In response, the language recited in claims 32 and 41-43 has been added back into the specification. Therefore, withdrawal of this objection is respectfully requested.

The Examiner has objected to claims 34, 47 and 48 under 37 C.F.R. 1.75(c) as being in improper dependent form for failing to limit further the subject matter of a previous claim. In response, claim 34 has been amended, thus limiting the substrate (not the film of free electron metal) to consisting essentially of gold. Claim 47 has been amended, thus limiting further the sulfur plasma deposited layer to one or more sulfur compounds. Claim 48, which depends from claim 40, limits further the arranged layer and the pre-selected gas and, therefore, is already in proper dependent form. In view of the foregoing, withdrawal of the rejection of claims 34, 47 and 48 is respectfully requested.

The Examiner has rejected claims 28, 35, 41 and 44-46 under 35 U.S.C. § 112, second paragraph, for indefiniteness. The Examiner asserts that claim 28 contradicts claim 25. In response, claim 28 has been canceled. The Examiner also asserts that the phrase "preferably being a monomer" renders claim 35 indefinite. In response, this phrase has been deleted from claim 35. Further, the Examiner asserts that the recitation "desired functionality" in claim 41 is unclear as to what desired functionality Applicants are referring to. In response, the word "desired" has been deleted from the recitation "desired functionality" in claims 41 and 42. The word "functionality" as used in the claims is a common term that is well defined in the art.

Regarding claim 44, the Examiner asserts that the recitation "the species" is unclear as to what species Applicants are referring to. In response, the recitation "the species" has been replaced with the phrase "chemical or biological species." The Examiner also asserts that claim 44 does not set forth the steps involved in performing the analyzing of the interaction between the species. In response, claim 44 has been amended to include the step of analyzing the interaction between chemical or biological species. The techniques used for "analyzing" are disclosed on page 1, lines 9-21 of the present specification. Because the step of "analyzing" in claim 44 is defined clearly in the specification, the techniques used for performing the analyzing does not need to be included in claim 44.

Regarding claim 45, the Examiner asserts that method claim 45 does not include a method step. In response, claim 45 has been amended to include the step of exposing or depositing chemical or biological species on the device of claim 25. The Examiner asserts that claim 46 does not include method steps. In response, claim 46 has been amended to include method steps. The Examiner also asserts that the recitations "a pre-selected, plasma deposited layer arranged on the free electron metal substrate" and "a free electron metal substrate" in claim 46 are unclear. In response, the above recitations have been amended to specify "a pre-selected, sulfur plasma deposited layer" and "a free electron metal substrate consisting essentially of gold." Claim 47 has also been amended to specify "sulfur plasma."

In view of the amendments made to claims 35, 41, 42, 44-46 and the above remarks, reconsideration and withdrawal of the rejection of claims 35, 41 and 44-46 are respectfully requested.

The present invention, as claimed in independent claim 25, is directed to a device for investigating reactions between interactive chemical or biological species. The device includes a substrate and a plasma layer. The substrate includes a film of free electron metal that consists essentially of gold. The plasma layer includes sulfur plasma which is deposited directly on the gold film of the substrate and defines a stable deposited plasma layer. As discussed in detail below, none of the cited prior art references teaches or suggests a plasma layer deposited directly onto a gold surface as claimed.

The Examiner rejected claims 25 and 28-31 under 35 U.S.C. § 102(b) for anticipation by International Application No. WO 90/05303 to Bergstrom (hereinafter "the Bergstrom patent"). The Examiner asserts that the Bergstrom patent discloses a device comprised of a substrate, and that a film of free electron metal of gold is applied to the substrate, wherein the gold surfaces are modified by sulfur compounds. Further, because the claims are directed to a product, the Examiner asserts that patentability of the claims does not depend on its method of production (plasma deposited). Therefore, the Examiner contends that the Bergstrom patent discloses the same device as recited in the claims. Applicants respectfully traverse this asserted rejection of the claims.

The Bergstrom patent is directed to methods for providing metal surfaces with surface layers capable of selective bio-molecular interactions. Furthermore, the invention also comprises activated surfaces for coupling a desired ligand, surfaces containing bound ligands, and the use of such surfaces in bio-sensors (page 1, first paragraph). The Bergstrom patent discloses a sensing surface for bio-sensor systems that includes a metal surface constituted by a film of free electron metals, such as copper, silver, aluminum or gold, wherein a monolayer of an organic molecule X-R-Y is supplied to the metal surface such that X binds to the metal and Y serves for coupling with functional ligands (page 5, third paragraph and page 6, second paragraph). The Bergstrom patent stresses the importance of a densely packed monolayer on the surface for protecting the metal surface from chemical corrosion. For the sake of optimum dense packing as stated in the Bergstrom patent, a hydrocarbon chain may optionally be interrupted by hetero atoms which are preferably straight having optionally double and/or triple bonds and a chain length that exceeds 10 atoms, preferably 12 to 30 atoms (page 6, fourth paragraph). Furthermore, the method of the Bergstrom patent of forming a densely packed layer to protect the underlying surface is referred to in the industry as self-assembled monolayers (SAMs), wherein a single layer is formed on a surface after a chemical reaction. In order to form this monolayer, the molecules must have a regular hydrocarbon chain that allows for this self-assembly into a well ordered, densely packed layer. The length of the hydrocarbon chain also affects the stability of the formed layer. As discussed below in detail, the Bergstrom patent does not teach a device that comprises a substrate having a plasma layer.

The term "plasma" has often been referred to as the fourth state of matter. The generation of plasma is analogous to the transition that occurs when energy is supplied to solid material, causing it to melt and the liquid becoming a gas. When sufficient additional energy is supplied to a gas, plasma is created. A plasma describes a state of a partially ionized gas which can, for example, be induced by applying an electric field to the gas under reduced pressure. The free electrons in the discharge are accelerated by the electric field and collide with neutral gas molecules. Due to these collisions, metastables, positive ions, electrons, free radicals and UV radiation are generated. When a plasma is created from a hydrocarbon gas, the plasma polymers are no longer polymer analogues of the "monomer." Because the plasma phase consists of a wide variety of very reactive species, the final composition of a surface after treatment with a plasma is essentially disordered and unpredictable and does not have the same chemical composition as the gas that was originally used. Therefore, the sulfur plasma layer of the present invention is a completely different layer having substantially different properties from the self-assembled monolayer disclosed in the Bergstrom patent. Because the Bergstrom patent does not teach or suggest a device having a plasma layer as claimed, reconsideration and withdrawal of the rejection of claims 25 and 29-31 are respectfully requested.

The Examiner has rejected claims 25, 28-31, 33, 34 and 37-48 under 35 U.S.C. § 103(a) for obviousness over the teachings of European Patent No. 0104608 to Dunn et al. (hereinafter "the Dunn patent") in view of the Bergstrom patent. The Examiner asserts that the Dunn patent teaches the claimed invention except for the teaching of 1) a film of gold on the substrate and 2) a bio/chemical functional layer that is chemically arranged on the plasma deposited first functional group species layer. Therefore, the Examiner contends that it would have been obvious to one of ordinary skill in the art to incorporate the use of a gold film as taught by the Bergstrom patent into the method and apparatus of the Dunn patent in order to provide for a more stable metal surface because of corrosion stability considerations. Furthermore, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to incorporate a hydrogel as taught by the Bergstrom patent into the method and device of the Dunn patent in order to provide for the minimization of undesired interactions. Applicants respectfully traverse this asserted rejection of the claims.

The Dunn patent is directed to a method for chemically modifying the surface of organic and/or inorganic substrates for attachment of large molecules having available functional groups, such as proteins. Further, the surface of the substrate is irreversibly modified by grafting specific chemical functional groups onto the surface with a plasma of suitable material, such as sulfur (see page 5, lines 13-20). The Dunn patent also discloses that the surface to be modified can be made of inorganic materials, such as non-metals, metals and metal oxides. The metals can include iron, aluminum, tin, copper and nickel (page 8, lines 30-31). Examples 1 and 3 of the Dunn patent disclose the use of plasma deposited onto polystyrene. As discussed below in detail, there is no teaching, suggestion or motivation in the Dunn patent to deposit a plasma layer directly onto a gold substrate.

The motivation to modify the prior art must flow from some teaching in the art that suggests the desirability or incentive to make the modification needed to arrive at the claimed invention. The motivation must come from the prior art, and not from the applicant's specification. In *EWP Corp. v. Reliance Universal, Inc.*, 755 F.2d at 907, it states that "a reference must be considered for everything it teaches by the way of technology and is not limited to the particular invention it is describing and attempting to protect. On the issue of obviousness, the combined teachings of the prior art as a whole must be considered." By the same token, "[i]t is impermissible within the framework of § 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." *In re Wesslau*, 353 F.2d 238, 241. As discussed in detail below, a fair reading of the Dunn patent in its entirety would not lead the skilled artisan to use gold as a substrate.

The Examiner contends that the motivation to use gold as a substrate in the Dunn patent comes from the fact that gold is highly resistant to corrosion as disclosed in the Bergstrom patent. Gold is a rare, noble metal that is known for its resistance to oxidation and corrosion. A noble metal is defined as any metal that is resistant to corrosion or oxidation and includes gold, silver and platinum. Silver and platinum also exhibit corrosion resistant properties similar to gold. However, the list of metals disclosed in the Dunn patent does not include silver and platinum. When considering the Dunn patent in its entirety, wherein all of the examples use a

polystyrene substrate and the list of metal substrates does not disclose any of the noble metals, the Dunn patent directs away from the use of highly corrosion resistant noble metals as a substrate for plasma deposition. Therefore, absent hindsight, there is no desire or incentive in the Dunn patent to use gold as a substrate.

As previously discussed, the Bergstrom patent requires a particular orientation of the organic molecule X-R-Y to the metal surface. For example, a specific orientation of the compound on the surface of the Bergstrom patent is such that X binds to the metal and Y serves for coupling with functional ligands. Because of the nature of a plasma, the specific type of orientation required in the process of the Bergstrom patent could not be achieved using a plasma, thereby destroying the intended function of the attachment process in the Bergstrom patent. Therefore, absent hindsight, there is no teaching, suggestion or motivation in the Bergstrom patent to provide a device that includes a gold substrate with a sulfur plasma layer on its surface.

Furthermore, because a plasma as disclosed in the Dunn patent is not suitable to yield a surface with a high degree of order and functionality such as required by the Bergstrom patent, one skilled in the art would not have combined these two references together in the first place.

In view of the foregoing, reconsideration and withdrawal of the rejection of claims 25, 29-31, 33, 34 and 37-48 are respectfully requested.

Regarding the obviousness rejection of claim 32 over the Dunn patent and the Bergstrom patent in view of U.S. Patent No. 5,942,397 to Tarlov et al. (hereinafter "the Tarlov patent"). The Examiner relies on the Tarlov patent for the asserted teaching of a substrate consisting of gold which has bound to its surface sulfur compounds. Claim 32 depends indirectly from claim 25 and is thus allowable over the teachings of the Dunn patent and the Bergstrom patent for the reasons discussed above.

Regarding the obviousness rejection of claim 35 over the Dunn patent and the Bergstrom patent in view of U.S. Patent No. 5,723,219 to Kolluri et al. (hereinafter "the Kolluri patent"), the Examiner relies on the Kolluri patent for the asserted teaching of the use of a gas monomer and plasma polymerization techniques. Claim 35 depends indirectly from claim 33

and is thus allowable over the teaching of the Dunn patent and the Bergstrom patent for the reasons discussed above.

Regarding the obviousness rejection of claim 36 over the Dunn patent and the Bergstrom patent in view of U.S. Patent No. 5,932,296 to Sluka et al. (hereinafter "the Sluka patent"), the Examiner relies on the Sluka patent for asserted teaching of a step of cleaning the substrate by means of a pulsed argon plasma before the application of the functional groups to the substrate. Claim 36 depends directly from claim 33 and is allowable over the teaching of the Dunn patent and the Bergstrom patent for the reasons discussed above.

CONCLUSION

In view of the foregoing, Applicants believe that claims 25 and 29-48 are patentable over the prior art of record and are in condition for allowance. Reconsideration and withdrawal of the Examiner's rejections and allowance of claims 25 and 29-48 are respectfully requested.

Respectfully submitted,

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